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## X-Y POSITION INDICATOR FOR A DISPLAY SYSTEM

Douglas C. Engelbart, Palo Alto, Calif., assignor to Stanford Research Institute, Menlo Park, Calif., a corporation of California

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8 Claims

### ABSTRACT OF THE DISCLOSURE

An X-Y position indicator control for movement by the hand over any surface to move a cursor over the display on a cathode ray tube, the indicator control generating signals indicating its position to cause a cursor to be displayed on the tube at the corresponding position. The indicator control mechanism contains X and Y position wheels mounted perpendicular to each other, which rotate according to the X and Y movements of the mechanism, and which operate rheostats to send signals along a wire to a computer which controls the CRT display.

### BACKGROUND OF THE INVENTION

This invention relates to visual display systems and, more particularly, to devices for altering the display at selected locations.

One of the potentially most promising means for delivering and receiving information to and from digital computers involves the display of computer outputs as visual representations on a cathode ray tube and the alteration of the display by a human operator in order to deliver instructions to the computer. In order for a human operator to readily change the displayed pattern, he must be provided with means for accurately indicating the exact position on the visual display at which he can make alterations. Devices are known which enable accurate position location on the tube display, such as a light pencil detector which is held against the tube while the entire tube is swept by the beam, the instant at which light is detected during the time required to sweep the entire face indicating the detector's position.

A disadvantage of the light pencil and other similar devices is that they generally require the human operator to hold the pencil against the CRT with one hand while changes are made. Consequently, the operator does not have both hands free to enter changes, as by typing them in, and cannot move to equipment only a step away from the CRT. Furthermore, the light pencil often covers part of the area of the CRT display where changes are to be entered, which interferes with the process.

### SUMMARY OF THE INVENTION

One subject of the invention is to provide an X-Y position indicating control mechanism for controlling indications of positions on a cathode ray tube (CRT) display, by movement along a surface which can be other than the face of the CRT.

Another object of the invention is to provide a position indicator control which transmits signals defining its position on a surface, and which is connected by only a cable to the apparatus which acts upon such information.

Still another object of the invention is to provide a simple and improved X-Y position locating device.

The foregoing and other objects are realized by an X-Y position indicator control mechanism comprising a small housing adapted to be held in the hand and having two wheels and an idler ball bearing for contacting the surface on which it rests. The two wheels are mounted with

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their axes perpendicular to each other and each wheel is attached to a potentiometer or other means for indicating its rotation. The position indicator control is held by the hand and moved over any surface, such as a desk top (or even may be moved by the feet). As the indicator control is moved, the two wheels rotate and the resistance of the potentiometer changes. Electrical leads connected to the potentiometers trail behind the indicator control and connect to a computer which continuously monitors the indicator control's position. The computer causes the CRT to display a symbol, or cursor, such as a short line on the CRT screen to define a position on the screen about which changes or the like may be made, the cursor position changing in accordance with movement of the X-Y position indicator control. Buttons are provided on the indicator control housing for closing switches to send pulses through additional wires trailing behind the indicator control to signal for a change in the displayed information. For example, one button on the indicator control may be used to cause the erasure of a small area directly above or following the cursor. New material may then be inserted in place of the material erased in accordance with the programming of the computer, as by typing in letters.

While a potentiometer may be connected to each of the two wheels on the indicator control, other devices can be used for generating signals indicating rotation of the wheels. One such device is a shaft position encoder which produces a digital output corresponding to the angular position of the wheel. While such an arrangement provides a direct digital output, instead of an analog output which must be digitally converted to be used by the computer control in the CRT display, the output from a shaft encoder necessitates a large cable. Still another means for indicating position of a wheel is an incremental encoder and counter. An incremental encoder generates an up indicating pulse each time the shaft moves by a certain increment of rotation in one direction and generates a down indicating pulse when the shaft moves in the other direction. These pulses are transmitted to an up-down counter, which provides a digital output equal to the sums of the up inputs minus the sum of the down inputs.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a pictorial illustration of a display system in accordance with the invention;

FIG. 2 is a sectional elevation view of the position indicating control mechanism of the invention;

FIG. 3 is a sectional plan view of the mechanism of FIG. 2;

FIG. 4 is a simplified schematic diagram of an electrical circuit for connection to a position indicating control mechanism of the invention;

FIG. 5 is a schematic diagram of another embodiment of an electrical circuit for use in the invention, wherein a shaft encoder is used;

FIG. 6 is still another embodiment of an electrical circuit for use in the invention, utilizing an incremental encoder; and

FIG. 7 is a schematic diagram of another circuit for use in the invention, which also employs an incremental encoder.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a display system constructed in accordance with the invention, comprising a cathode ray tube display 10 for creating visual patterns on the face 12 of a cathode ray tube, a computer system 14 including a typewriter input apparatus 15 which generates signals that define the patterns displayed by the CRT display system, and an X-Y position indicator control 16. The position